

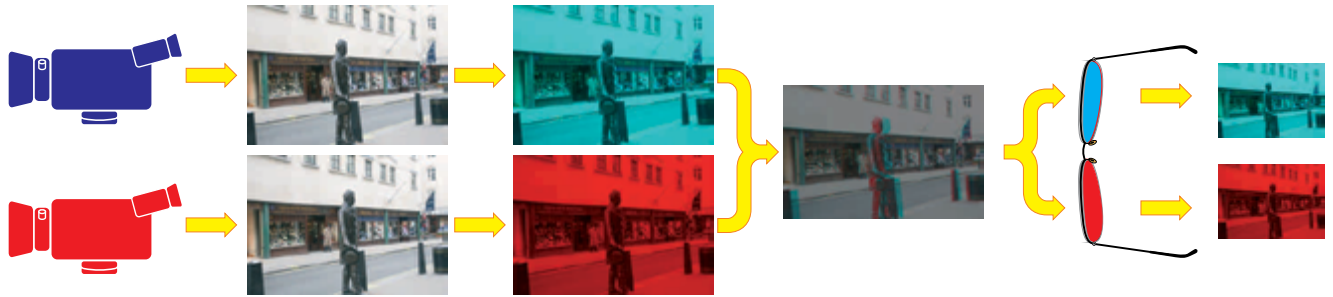
# Displaying & Viewing 3D

At present there are five methods of displaying and viewing 3D material.

## Anaglyph



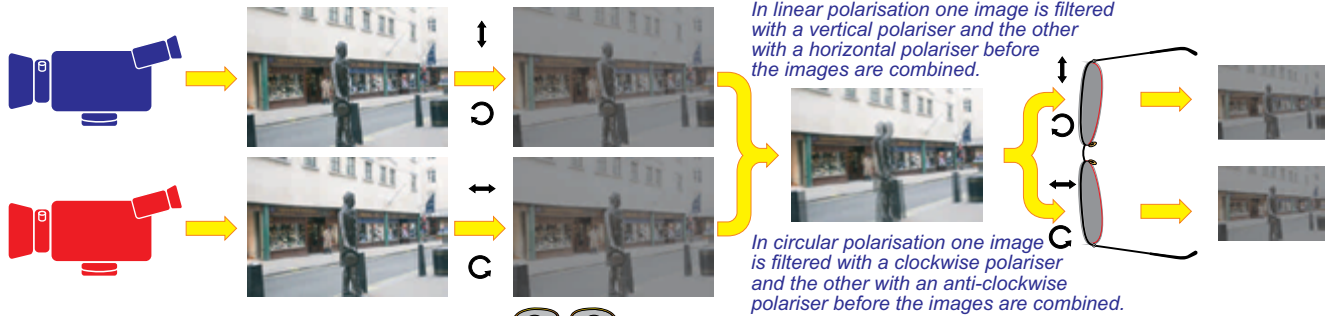
Anaglyph is the oldest, simplest and still the most common of the five current methods of showing 3D. The left image is red filtered and the right image is cyan filtered opposing colours on a conventional colour wheel. The two images are combined into a single image. The glasses have red and cyan filters, thus splitting the image back into two images, one for each eye.



## Linear polarisation



Both images are linearly polarised on the display and shown together. The left eye vertically and the right eye horizontally. The glasses have a linear polarising filter for each eye, vertical for the left eye and horizontal for the right eye. Thus the glasses split the displayed image back into two images, one for the left and the other for the right eye.



## Circular polarisation

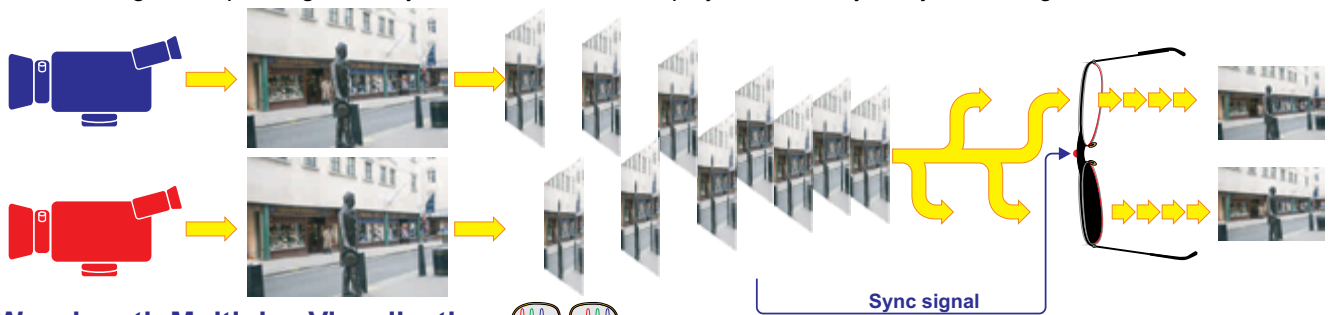


Both images are circularly polarised on the display and shown together. The left eye clockwise and the right eye anti-clockwise. The glasses have a circular polarising filter for each eye, clockwise for the left eye and anti-clockwise for the right eye. Thus the glasses split the displayed image back into two images, one for the left and the other for the right eye.

## Shuttered



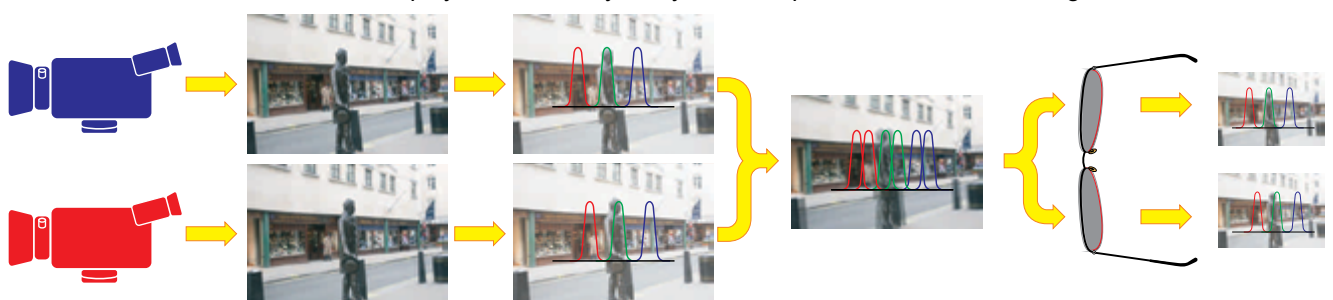
Each image is shown on the display separately, one after the other, left, right, left, right, at a fast enough rate to overcome flickering. The display also extracts an infra-red synchronisation signal which is sent to the glasses to tell them which image is being displayed. The glasses are active, and use an LCD shutter in each eye to sequentially shut each eye, while opening the other. The signal keeps the glasses synchronised with the display, and each eye only sees images intended for it.



## Wavelength Multiplex Visualisation



Each image is filtered with a narrow band optical filter down to its basic primary colours, red, green and blue. The exact primary colours are slightly different for the left eye and right eye. Thus the two images can be combined on the display, while still being able to differentiate each one. The glasses contain a narrow band optical filter in each eye, exactly matched to the narrow band filters used in the display. Thus each eye only sees the part of the combined images intended for it.



System Features	Anaglyph	Linear polarisation	Circular polarisation	Shuttered	WMV
<b>Operation</b>	Red left filter. Cyan right filter. Combined image. Simultaneous display.	Vert. pol. right filter. Horiz. pol. left filter. Combined image. Simultaneous display.	Clockwise pol. right filter. Anti-clockwise pol. left filter. Combined image. Simultaneous display.	Frame sequential display. Active locked glasses.	Narrow band primary coloured filtered left and right with colour offset.
<b>Advantages</b>	Established system. Cheap. Easily produced.	Cheap glasses.	Cheap glasses. Viewer's head position unimportant.	Wide angle of view. Clear image when not using 3D.	Good 3D separation.
<b>Disadvantages</b>	Inefficient. Poor colour reproduction. Requires exact match between display & glasses.	Required special display. Darker image. Viewer's head must be vertical.	Requires special display. Darker image. Narrower angle of view in cinemas	Quite inefficient. Prone to flickering. Active and expensive glasses.	Inefficient. Expensive glasses. Prone to flickering if frame sequential displays are used.
<b>Usage</b>	Good for magazines, posters and other printed work. Old cinema system. Not a good TV system.	Useless for both movies and TV because the viewers' heads must be exactly vertical.	Popular in cinemas and professional monitoring. Glasses are cheap and can be washed and reused many times.	Good for home use. Expensive and impractical for cinema use.	Used in some cinemas but high security on glasses due to cost. Not used in the home.
<b>Supporting Company</b>	-	-	RealD	Xpand, Sony, NVIDEA	Dolby